

NOAA SCIENTIFIC PUBLICATIONS REPORT MARCH 23, 2015

HIGHLIGHTED ARTICLES

[Human, oceanographic and habitat drivers of central and western Pacific coral reef fish assemblages](#)

PLoS ONE (3.534)

[Determining age and residency of loggerhead turtles \(*Caretta caretta*\) at a North Pacific bycatch hotspot using skeletochronology](#)

Biological Conservation (4.036)

[Recovery potential of the world's coral reef fishes](#)

Nature (10.742)

[Assessing the relationship between freshwater habitat need and habitat restoration for Pacific Salmon across the Pacific Northwest](#)

Ecosphere (2.595)

[A characterization of common bottlenose dolphin \(*Tursiops truncatus*\) interactions with the commercial shrimp trawl fishery of South Carolina, USA](#)

Journal of Cetacean Research and Management (n/a)

[Efficiency of short-lived halogens at influencing climate through depletion of stratospheric ozone](#)

Nature Geoscience (11.668)

ADDITIONAL ARTICLES

[NMFS Publications](#)

[How should we harvest an animal that can live for centuries?](#)

North American Journal of Fisheries Management (1.110)

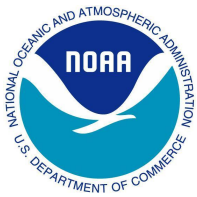
[Estimating the riverine abundance of Green Sturgeon using a DIDSON acoustic camera](#)

North American Journal of Fisheries Management (1.110)

[Inference of historical fishing mortality rates for an endangered Chinook salmon \(*Oncorhynchus tshawytscha*\) population](#)

Fishery Bulletin (1.783)

[Hydraulic and geomorphic processes in an overbank flood along a meandering,](#)



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[gravel-bed river: implications for chute formation](#)

Earth Surface Processes and Landforms (2.695)

[Incorporation of bomb-produced \$^{14}\text{C}\$ into fish otoliths. An example of basin-specific rates from the North Pacific Ocean](#)

Canadian Journal of Fisheries and Aquatic Sciences (2.276)

[Physiological and pathological changes in the eastern oyster *Crassostrea virginica* infested with the trematode *Bucephalus sp.* and exposed to the toxic dinoflagellate *Alexandrium fundyense*](#)

Journal of Invertebrate Pathology (2.601)

[Movement of invasive adult lionfish *Pterois volitans* using telemetry: importance of controls to estimate and explain variable detection probabilities](#)

Marine Ecology Progress Series (2.64)

[Age, growth and natural mortality of coney \(*Cephalopholis fulva*\) from the southeastern United States](#)

PeerJ (n/a)

[The Right Whale mandatory ship reporting system: a retrospective](#)

PeerJ (n/a)

[Transport of blue crab larvae in the northern Gulf of Mexico during the Deepwater Horizon oil spill](#)

Marine Ecology Progress Series (2.64)

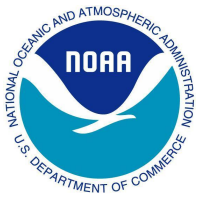
[Reducing bycatch in the United States Gulf of Mexico shrimp trawl fishery with an emphasis on red snapper bycatch reduction](#)

Fisheries Research (1.843)

[Systematics of North Pacific sand lances of the genus *Ammodytes* based on molecular and morphological evidence with description of a new species from Japan](#)

Fishery Bulletin (1.783)

[Migratory patterns of wild Chinook salmon *Oncorhynchus tshawytscha* returning to](#)



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[a large, free-flowing river basin](#)

PLoS ONE (3.534)

[Using parentage analysis to estimate rates of straying and homing in Chinook salmon](#)

Molecular Ecology (5.84)

[A multi-phylum study of grazer-induced paralytic shellfish toxin production in the dinoflagellate *Alexandrium fundyense*: a new perspective on control of algal toxicity](#)

Harmful Algae (3.34)

[Factors regulating excystment of *Alexandrium catenella* in Puget Sound, WA, USA](#)

Harmful Algae (3.34)

[Stable isotope analysis elucidates sex and size effects on diet composition of Salish Sea harbor seals \(*Phoca vitulina*\)](#)

Marine Ecology Progress Series (2.64)

[Genetic and morphological divergence in three strains of brook trout commonly stocked in Lake Superior](#)

PLoS ONE (3.534)

[Pathogenicity of members of the Vibrionaceae family to cultured juvenile sablefish](#)

Aquaculture (2.586)

[OAR Publications](#)

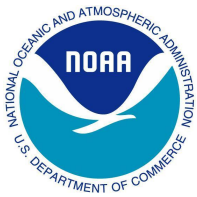
[Improved seasonal prediction of temperature and precipitation over land in a high-resolution GFDL climate model](#)

Journal of Climate (4.904)

[Potential impact of climate change on the intra-Americas sea: Part-1. a dynamic downscaling of the CMIP5 model projections](#)

Journal of Marine Systems (1.425)

[High resolution observations of the near-surface wind field over an isolated mountain and in a steep river canyon](#)



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Atmospheric Chemistry and Physics (5.298)

[Methane leaks from three large U.S. natural gas fields in line with federal estimates](#)

Journal of Geophysical Research-Atmospheres (3.44)

[Meteorological modeling using WRF-ARW model for Grand Bay Intensive studies of atmospheric mercury](#)

Atmosphere (1.015)

[Recent trends in global emissions of hydrochlorofluorocarbons and hydrofluorocarbons: Reflecting on the 2007 adjustments to the Montreal Protocol](#)

Journal of Physical Chemistry (2.775)

NWS Publications

[The value of dual-polarization radar in diagnosing the complex microphysical evolution of an intense snowband](#)

Bulletin of the American Meteorological Society (11.57)

[A preliminary assessment of using spatiotemporal lightning patterns for a binary classification of thunderstorm mode](#)

American Meteorological Society Weather and Forecasting Journal (1.61)

NESDIS Publications

[Extended reconstructed sea surface temperature version 4 \(ERSST.v4\), Part II. Parametric and structural uncertainty estimations](#)

Journal of Climate (4.90)

NOS Publications

[Exploration and mapping of the deep Mesoamerican reef](#)

Oceanography (2.986)

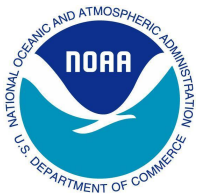
OTHER REPORTS, BOOK CHAPTERS, AND INTERNAL PUBLICATIONS

[REServ: an ecosystem services assessment using bioextraction technologies for removal of nitrogen and other substances in Long Island Sound and the Great Bay/Piscataqua Region](#)

NOAA Coastal Ocean Program Decision Analysis Series No. XXX.

[Transport pathways of marine larvae around the Mariana Archipelago](#)

NOS Technical Memorandum



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[Great Lakes water levels surge](#)

Eos, Transactions American Geophysical Union

HIGHLIGHTED ARTICLES

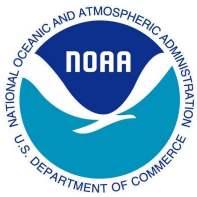
Human, oceanographic and habitat drivers of central and western Pacific coral reef fish assemblages

PLoS One (3.534)

I. D. Williams, J. K. Baum, A. Heenan, K. M. Hanson, M. O. Nadon and R. Barnard (NMFS/PIFSC/CRED)

- Available datasets from ~40 islands and atolls spread widely across the western and central Pacific allowed for the assessment of the importance of human and oceanographic factors driving differences in fish assemblages among coral reef areas and for the use of models to improve quantification of the extent of human impacts accounting for a range of other factors.
- Important component of study demonstrated the extent to which coral reefs' capacity to support large fish populations varies among what was assumed were relatively unimpacted reef areas.

Coral reefs around US- and US-affiliated Pacific islands and atolls span wide gradients of oceanographic and environmental drivers and potential human impact. We use generalized additive modeling and data from a consistent large-scale coral reef ecosystem monitoring program covering ~40 islands and atolls together with recently synthesized satellite-derived oceanographic metrics to explore the relative importance of a range of factors (oceanic productivity, wave energy, temperature, coral cover, structural complexity, and human population density) potentially driving differences in reef fish assemblages across those coral reef areas. In total, data from 1,934 survey sites, constituting > 2,000 hours of underwater observation were used in this study. Consistent with previous smaller-scale studies, our results show strong impacts of human population density including sharp declines in reef fish biomass at relatively low human population density, followed by more gradual declines as human population density increased further. Adjusting for other factors, highest levels of oceanic productivity among our study locations was associated with more than double the biomass of reef fishes (including ~4 times the biomass of planktivores and piscivores) compared to islands with lowest oceanic productivity. Our results emphasize that coral reef areas do not all have equal ability to sustain large reef fish stocks, and that what is natural varies among locations. Comparison of biomass estimates derived from visual surveys with predicted biomass in absence of humans indicated that total reef fish biomass was depleted by 61% to 69% at



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populated islands in the Mariana Archipelago; by 20% to 78% in the main Hawaiian Islands; and by 21% to 56% in American Samoa.

Expected publication date: early 2015

Determining age and residency of loggerhead turtles (Caretta caretta) at a North Pacific bycatch hotspot using skeletochronology

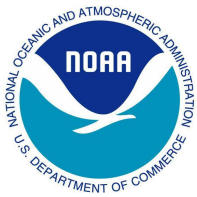
Biological Conservation (4.036)

C. N. Turner Tomaszewicz, J. A. Seminoff, **L. Avens**, **L. R. Goshe**, S. H. Peckham, J. M. Rguez-Baron, K. Bickerman, and C. M. Kurlle (NMFS/SEFSC)

- The authors present the first estimates of age distribution for an important foraging population of endangered North Pacific loggerhead sea turtles near the Baja California Peninsula in Mexico that is experiencing high levels of mortality due to fishery bycatch.
- The survival estimates, which are based on the duration of the life stage spent foraging near the Baja California Peninsula in Mexico, are very low (less than 10 percent) and highlight the importance of conservation efforts to reduce fishery bycatch for this endangered population.

For migratory marine animals like sea turtles, effective conservation can be challenging because key demographic information such as duration of life stages and exposure to spatially explicit threats in different habitats are often unknown. In the eastern Pacific near the Baja California Peninsula (BCP), Mexico, tens of thousands of endangered North Pacific loggerhead sea turtles (*Caretta caretta*) concentrate at a foraging area known to have high rates of fishery bycatch. Because stage survivorship of loggerheads in the BCP will vary significantly depending on the number of years spent in this region, we applied skeletochronology to empirically estimate residency duration in this bycatch hotspot. The observed age distribution obtained from skeletochronological analysis of 146 dead-stranded loggerheads ranged from three to 24 years old, suggesting a BCP residency of >20 years. Given the maximum estimated age and a one-year migration to western Pacific nesting beaches, we infer age-at-maturation for BCP loggerheads at ~25 years old. We also examine survivorship at varying BCP residency durations by applying our findings to current annual mortality estimates. Predicted survivorship of loggerheads spending over 20 years in this BCP foraging habitat is less than 10 percent, and given that ~43,000 loggerhead turtles forage here, a significant number of turtles are at extreme risk in this region. This is the first empirical evidence supporting estimated age-at-maturation for BCP loggerheads, and also the first estimates of BCP stage survivorship. Our findings emphasize the urgent need for continued and effective international conservation efforts to minimize bycatch of this endangered species.

Expected publication date: Spring 2015



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Recovery potential of the world's coral reef fishes

Nature (10.742)

M. A. MacNeil, N. Graham, J. Cinner, S. Wilson, **I. Williams (NMFS/PIFSC/CRED)**, J. Maina Mbui, S. Newman, A. Friedlander, S. Jupiter, N. Polunin, and T. R. McClanahan

- The authors incorporate global information from marine reserves, remote reefs and priors from previous studies, to quantify a global estimate of unfished reef fish biomass of ~1049 kg/ha.
- Findings suggest that the time needed to achieve a recovery in biomass to 90% of unfished levels ranges from ~80 years for heavily fished sites to less than 20 years for lightly fished.
- In addition, they discovered that management alternatives such as gear and access restrictions achieved critical returns in function.

Ongoing declines in coral reef condition have generated substantial interest in local management to support reef resilience. Excessive fishing is a major local source of reef degradation, yet selecting the right management approach to recover reef fish biomass and function to desired levels requires knowing the state of the system, outcomes of management alternatives, and timeframes for success. Here, incorporating global information from marine reserves, remote reefs and priors from previous studies, we quantify a global estimate of unfished reef fish biomass of ~1049 kg/ha. We use this information to estimate that the time required for reef fish biomass to recover to 90% of unfished levels ranges from ~80 years for heavily fished sites to less than 20 years for lightly fished, regulated areas. Importantly, reef fish functional returns were non-linear over this gradient, and management alternatives such as gear and access restrictions achieved critical returns in function, allowing coral reef managers to develop recovery plans that meet near term conservation and livelihood objectives.

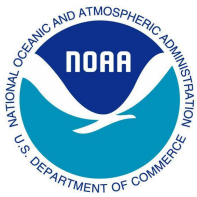
Expected publication date: early 2015

Assessing the relationship between freshwater habitat need and habitat restoration for Pacific Salmon across the Pacific Northwest

Ecosphere (2.595)

K. Barnas, S. L. Katz, D. E. Hamm, M. Diaz, and **C. E. Jordan (NMFS/NWFSC)**

- The article presents a methodology to evaluate restoration efforts of Pacific Salmonids by studying whether restoration matches ecological needs.
- Authors conclude that habitat restoration does not broadly match the identified ecological needs of salmon habitat.



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With 17 Evolutionarily Significant Units (ESU) and Distinct Population Segments (DPS) of Pacific salmonids listed under the Endangered Species Act in Washington, Oregon and Idaho, habitat restoration is widely implemented in hopes of achieving recovery goals. However, the need remains for a methodology to evaluate restoration compared with habitat assessments at scales relevant to recovery planning. We assessed whether (1) restoration matches ecological need at the sub-watershed scale within a salmon population for two ESUs and, (2) whether the restoration matches ecological need at the salmon population scale within all ESU/DPSs with available data. We compared completed restoration actions to ecological concerns found in habitat assessments (Columbia Cascade Ecoprovince subbasin plans and ESA salmon recovery plans) using an ecological concerns data dictionary. For each spatial unit, we calculated Salmon Habitat Assessment and Project Evaluator (SHAPE) metric (-1 to 1), which measures the mismatch or match between projects and ecological concerns and looked at other factors influencing project choice including cost. Overall we found no correlation between an ecological concern's frequency in habitat assessments and its frequency as a target of restoration, yet populations with more ecological concerns did contain more restoration effort ($p < 0.05$). For both the sub-watersheds and salmon populations, projects were strongly biased towards less expensive types, suggesting that targeted restoration may be more expensive to implement than opportunistic projects. Further, a majority of sub-watersheds contained a suite of projects that matched ecological concerns no better, and often worse, than a random pick of an equal number of projects. At the scale of a salmon population within an ESU/DPS, 84% populations received a good SHAPE score, above 0.6). Our results present a very mixed picture of restoration implementation across the landscape and suggest that tangible gains in restoration effectiveness can be made.

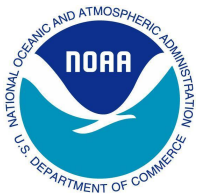
Expected publication date: Spring 2015

A characterization of common bottlenose dolphin (Tursiops truncatus) interactions with the commercial shrimp trawl fishery of South Carolina, USA

Journal of Cetacean Research and Management

J. T. Greenman and W. E. McFee (NOS)

- This study was the first of its kind on the east coast of the U.S. to determine the level of mortality of bottlenose dolphins, a protected species under the MMPA, in the shrimp trawl mortality.
- While overall mortality in the fishery may still be regarded as low, this study showed that mortality is underreported.
- This study justified the designation of a Category II fishery by NMFS.



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In the United States, interactions between the shrimp trawl fishery and bottlenose dolphins (*Tursiops truncatus*) are known to exist; however, the level of mortality is largely unknown, and has not been studied in South Carolina (SC), USA. The current study attempted to determine if interactions between bottlenose dolphins and the SC commercial shrimp trawl fishery pose a significant threat to dolphin populations and if fishery related mortality is underreported. On-board observations were made during a 25 day (Aug. – Dec. 2010) field study. No dolphin takes occurred during the observational period. These observations focused on direct physical interactions with the gear and depredation behaviors. Additionally, a sub-sample of shrimp fishers in South Carolina was asked to participate in a mailed survey. The survey included questions related to gear, dolphin observations, and the status of the shrimp fishery. This study also utilized historical dolphin stranding data from the NOAA/CCEHBR Marine Mammal Information System database to ascertain signs of shrimp fishery interactions. A three-tiered flow diagram was developed to characterize each stranding case according to the likelihood that mortality resulted from trawler interaction. Field results point to significant dolphin presence around commercial trawlers ($x^2 = 23.406$, $p < 0.001$). In addition, survey results showed 12 unreported incidents of shrimp trawl fishery mortality. Finally, stranding records revealed several more cases with signs of possible trawler interaction. Therefore, the current U.S. National Marine Fisheries Service designation of the fishery as a Category II fishery is correct. Increased observer coverage and improved communication with the fishery on the importance of reporting takes is warranted.

Expected publication date: March 2015

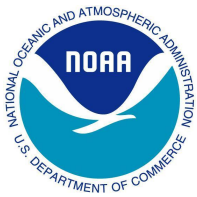
Efficiency of short-lived halogens at influencing climate through depletion of stratospheric ozone

Nature Geoscience (11.668)

R. Hossaini, M.P. Chipperfield, S.A. Montzka, A. Rap, S. Dhome, and W. Feng
(OAR/ESRL/GMD)

- Anthropogenically-produced short-lived halogens have increased by 7.7% between 2000-2012 and have doubled globally since the late 1990s.
- Short-lived halogens could impact radiative forcing of the climate and are not controlled by the Montreal Protocol.

Halogens released from long-lived anthropogenic substances, such as chlorofluorocarbons, are the principal cause of recent ozone depletion in the lower stratosphere. Researchers examined atmospheric model simulations that showed how natural, short-lived halogen substances can also significantly contribute to stratospheric ozone loss and are thereby efficient at influencing



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climate. Short-lived chlorine substances largely driven by anthropogenic emissions of chemicals could also destroy lower stratospheric ozone. While this loss is currently relatively small, researchers demonstrated that the atmospheric concentration of dichloromethane, the most abundant of these, is increasing rapidly (7.7%/yr between 2000-2012) and atmospheric concentrations have doubled since the late 1990s throughout the globe. Since pre-industrial times, researchers estimate that short-lived halogens have contributed a total of -0.02 (-0.01 to -0.03) W m⁻² to the radiative forcing of climate. These short-lived chlorinated gases emitted from human activities historically have not been controlled by the Montreal Protocol because their past contributions to ozone depletion were relatively small and constant over time. Researchers concluded that the significant increases in short-lived halogen atmospheric abundance, through changing natural processes or continued anthropogenic emissions, would be important for future climate forcing. <http://journals.ametsoc.org/doi/pdf/10.1175/BAMS-D-14-00017.1>
Expected publication date: February 2015

ADDITIONAL ARTICLES

NMFS Publications

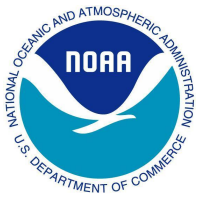
How should we harvest an animal that can live for centuries?

North American Journal of Fisheries Management (1.110)

D. R. Hennen (NMFS/NEFSC)

- This paper presents the first ever Management Strategy Evaluation on Ocean Quahog – and extremely long-lived and unproductive species
- The evaluation demonstrates that current management is probably adequate for maintaining a sustainable fishery for at least 100 years if current fishing mortality (F) does not increase very much.
- The results offer general insights on managing extremely long lived and unproductive species (low and slow fishing is the way to do it).

Ocean Quahog (*Arctica islandica*) are an extremely long lived and slow growing marine bivalve that supports fisheries in several countries bordering the northern Atlantic ocean. The life history of the Ocean Quahog presents several unique challenges to fishery managers. Scientists currently have a poor understanding of recruitment and how it might respond to declining population biomass due to fishing pressure, in part because most fisheries have operated for less than one Ocean Quahog generation. It is therefore difficult to develop management quantities, such as biological reference points, using traditional means. This simulation study examines Ocean Quahog recruitment dynamics, and explores the implications of a suite of fishing intensities and biomass reference points. Results support the following recommendations: 1)



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Ocean Quahog fisheries should be prosecuted with very low fishing mortality rates, as $F_{\text{target}} > 0.03$ tended to result in fishery closures while not having much effect on yield. 2) Given low F_{target} , Ocean Quahog fisheries are likely to tolerate a relatively low biomass threshold value. 3) Understanding spatial structure is important for maintaining a functional fishery.

Expected publication date: April 2015

Estimating the riverine abundance of green sturgeon using a DIDSON acoustic camera
North American Journal of Fisheries Management (1.110)

E. A. Mora, **S. T. Lindley**, D. L. Erickson, and A. P. Klimley (NMFS/SWFSC)

- The authors have developed a method to census green sturgeon adults when they are in their spawning rivers, providing the first estimates of the absolute abundance for a population of this ESA-listed species in the Sacramento River.
- It appears that there are a few hundred adults in the Rogue River population, which is thought to be larger than the Sacramento population.

To determine the total number of Green Sturgeon *Acipenser medirostris* present in the Rogue River, Oregon, the authors compared plot sampling using a DIDSON acoustic camera, a density based estimation technique combining the number of individuals detected and the area sampled, to a concurrent mark-recapture estimate. Using the DIDSON-based method, they estimated the total abundance of Green Sturgeon to be 223 (95% confidence interval = 180 - 266). The mark-recapture method resulted in an estimate of 236 (150 - 424). The non-invasive DIDSON transect estimates resulted in tighter confidence intervals and required fewer technician hours to collect the data (37 vs. 232 hrs). Precise estimates of the abundance and distribution of Green Sturgeon are important components to species recovery and management. Thus, this new technique has the potential to greatly improve population monitoring and is an excellent tool to identify occupied habitats.

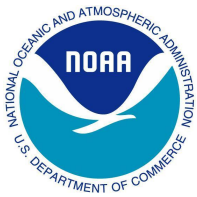
Accepted: January 2015

Inference of historical fishing mortality rates for an endangered Chinook salmon
(*Oncorhynchus tshawytscha*) population

Fishery Bulletin (1.783)

M. R. O'Farrell and **W. H. Satterthwaite** (NMFS/SWFSC)

- The fishing mortality rate for Sacramento River winter Chinook salmon was hindcasted for years 1978-2012 (35 years).



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- Results suggest that fishing mortality rates have decreased in recent years, after a peak in the mid-1980s through the mid-1990s.
- These results provide some context to the fishing mortality experienced by winter Chinook both before and after the time of ESA listing.

The time series of fishery exploitation rate estimates for Endangered Species Act (ESA)-listed Sacramento River winter Chinook (SRWC) salmon (*Oncorhynchus tshawytscha*) is confined to a relatively recent period for which coded-wire tag data are available. However, the nature of the ocean salmon fisheries before this period was substantially different, and it is likely that these recent exploitation rates do not represent the level of fishing mortality experienced by SRWC in earlier years. To infer historical exploitation rates, a model was developed to hindcast the age-3 impact rate (an approximation of the exploitation rate) using 35 years of fishing effort estimates coupled with contemporary estimates of fishery encounter rates for SRWC. The hindcasted impact rates were highest in a period from the mid 1980s through the late 1990s. Over time, the proportion of the impact rate attributed to commercial and recreational fisheries diverged from approximately equal shares early in the time series to an impact rate mostly comprised of recreational fishery mortality in more recent years. The exploitation rate inferences made here provide context to the fishing mortality experienced by SRWC both before and after the time of their ESA listing through a dynamic period for ocean salmon fisheries in California.

Accepted: January 2015

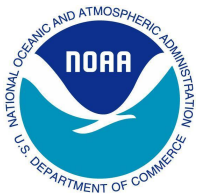
Hydraulic and geomorphic processes in an overbank flood along a meandering, gravel-bed river: implications for chute formation

Earth Surface Processes and Landforms

L. R. Harrison (NMFS/SWFSC), T. Dunne and G. B. Fisher

- In this study, the authors use a reconstructed, gravel-bedded, meandering river as a field laboratory for studying hydraulic interactions between rivers and floodplain mechanisms at a realistic scale.
- Using an integrated field and modeling approach, the authors quantified the flow exchanges between the river channel and its floodplain during an overbank flood, and identified locations where flow had the capacity to erode floodplain chutes.
- The authors developed a predictive modeling framework that is transferable to river systems and can be used to help guide floodplain restoration projects.

Hydraulic interactions between rivers and floodplains produce off-channel chutes, the presence of which influences the routing of water and sediment and thus the planform evolution of



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meandering rivers. Detailed studies of the hydrologic exchanges between channels and floodplains are usually conducted in laboratory facilities, and studies documenting chute development are generally limited to qualitative observations. Hydraulic measurements and modeling indicated high rates of flow exchange between the channel and floodplain, with flow rapidly decelerating as water was decanted from the channel onto the floodplain due to the frictional drag provided by substrate and vegetation. Peak shear stresses were greatest downstream of the maxima in bend curvature, along the concave bank, where terrestrial LiDAR scans indicate initial floodplain chute formation. A second chute has developed across the convex bank of a meander bend, in a location where sediment accretion, point bar development and plant colonization have created divergent flow paths between the main channel and floodplain. In both cases, the off-channel chutes are evolving slowly during infrequent floods due to the coarse nature of the floodplain, though rapid chute formation would be more likely in finer-grained floodplains. The controls on chute formation at these locations include the flood magnitude, river curvature, cross-stream position of the high velocity core, floodplain gradient, erodibility of the floodplain sediment, and the flow resistance provided by riparian vegetation. This study illuminates the mechanisms that promote off-channel floodplain chutes, whose presence can increase the ecological value of the valley floor.

Accepted: January 2015

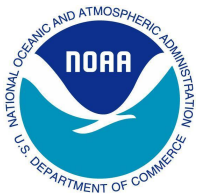
Incorporation of bomb-produced ^{14}C into fish otoliths. An example of basin-specific rates from the North Pacific Ocean

Canadian Journal of Fisheries and Aquatic Sciences (2.276)

S. G. Wischniowski, **C. R. Kastle**, T. Loher, and **T. E. Helser (NMFS/AKFSC)**

- Sagittal otoliths from juvenile Pacific halibut (*Hippoglossus stenolepis*) of known age were used to create a bomb-produced radiocarbon reference chronology for the Eastern Bering Sea (EBS).
- The authors determined that regionally specific Gulf of Alaska (GOA) and EBS oceanography plays a considerable role in the $\Delta^{14}\text{C}$ values, and must be taken into consideration when selecting a reference chronology for bomb-produced ^{14}C age-validation studies.
- The age-validation samples indicated that the current ageing methodology used in Pacific halibut assessments is accurate and has provided accurate age assignments for Pacific halibut in the EBS.

Sagittal otoliths from juvenile Pacific halibut (*Hippoglossus stenolepis*) of known age were used to create a bomb-produced radiocarbon reference chronology for the eastern Bering Sea



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(EBS) by fitting a coupled-function model to $\Delta^{14}\text{C}$ values from each specimen's birth year. The newly-created EBS reference chronology was then compared to a reference chronology previously created for Pacific halibut from the Gulf of Alaska (GOA). Adult Pacific halibut age-validation

samples from the EBS were also analyzed for ^{14}C and modeled to validate age estimation accuracy. A Bayesian model was developed and Markov Chain Monte Carlo simulation was used to estimate model parameters and adult Pacific halibut ageing bias. Differences in reference chronologies between ocean basins were reflected in large deviance information criterion (ΔDIC) between models, supporting the hypothesis that two separate coupled-function models were required to adequately describe the data, one each for the EBS and GOA.

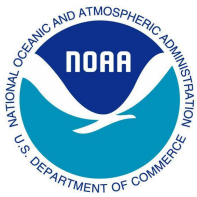
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Physiological and pathological changes in the eastern oyster Crassostrea virginica infested with the trematode Bucephalus sp. and exposed to the toxic dinoflagellate Alexandrium fundyense
Journal of Invertebrate Pathology (2.601)

M. Lassudrie, **G. H. Wikfors**, I. Sunila, **J. H. Alix**, **M. S. Dixon**, D. Combot, P. Soudant, C. Fabioux, and H. Hégaret (NMFS/NEFSC)

- Oysters are subject to simultaneous parasite infestation and harmful algal bloom exposure.
- Combined effects of parasites and harmful algae can be debilitating and erode immune defense functions in oysters

Effects of experimental exposure to the toxic dinoflagellate *Alexandrium fundyense*, a Paralytic Shellfish Toxin (PST) producer known to affect bivalve physiological condition, upon eastern oysters, *Crassostrea virginica* with a variable natural infestation of the digenetic trematode *Bucephalus sp.* were determined. After a three-week exposure to cultured *A. fundyense* or to a control algal treatment with a non-toxic dinoflagellate, adult oysters were assessed for a suite of variables: histopathological condition, hematological variables (total and differential hemocyte counts, morphology), hemocyte functions (Reactive Oxygen Species (ROS) production and mitochondrial membrane potential), and expression in gills of genes involved in immune responses and cellular protection (MnSOD, CAT, GPX, MT-IV, galectin CvGal) or suspected to be (Dominin, Segon). By comparing individual oysters infested heavily with *Bucephalus sp.* and uninfested individuals, we found altered gonad and digestive gland tissue and an inflammatory response (increased hemocyte concentration in circulating hemolymph and hemocyte infiltrations in tissues) associated with trematode infestation. Exposure to *A. fundyense* led to a higher weighted prevalence of infection by the protozoan parasite Perkinsus



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marinus, responsible for Dermo disease. Additionally, exposure to *A. fundyense* in trematode-infested oysters was associated with the highest prevalence of *P. marinus* infection. These observations suggest that the development of *P. marinus* infection was advanced by *A. fundyense* exposure, and that, in trematode-infested oysters, *P. marinus* risk of infection was higher when exposed to *A. fundyense*. These effects were associated with suppression of the inflammatory response to trematode infestation by *A. fundyense* exposure. Additionally, the combination of trematode infestation and *A. fundyense* exposure caused degeneration of adductor muscle fibers, suggesting alteration of valve movements and catch state, which could increase susceptibility to predation. Altogether, these results suggest that exposure of trematode-infested oysters to *A. fundyense* can lead to overall physiological weakness that decreases oyster defense mechanisms.

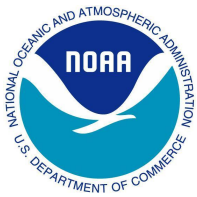
Accepted: January 2015

Movement of invasive adult lionfish Pterois volitans using telemetry: importance of controls to estimate and explain variable detection probabilities

Marine Ecology Progress Series (2.64)

- The authors surgically implanted 25 lionfish with ultrasonic transmitters at a natural hard bottom area off North Carolina, USA, in December, 2008, and February, 2009, and used an array of remote, underwater receivers to monitor movements in the study area for up to 6 months.
- The authors found that lionfish move very little as adults, so expansion of this invasive species into new areas likely occurring at egg or larval stage.

The Indo-Pacific lionfish *Pterois volitans* has invaded western Atlantic Ocean coastal habitats over the past two decades and has the potential to cause major ecological changes in reef fish communities. While many aspects of lionfish ecology in their invaded range have been examined, there is a paucity of information on movements of lionfish, particularly adults. The authors also affixed a control transmitter in the study area to assess changes in transmitter detection rate as a function of multiple variables, and used a generalized additive model to show that the control transmitter detection rate declined with time, increasing water temperature, and increasing wave period. Despite variable detection probabilities, the authors found that telemetered lionfish remaining in the study area displayed high site fidelity to areas no broader than 400 m in diameter; daily movements were nearly always less than 150 m. By estimating variable detection rates of transmitters and lionfish movements, the authors provided information that can be useful to understand the spatial scale of their impact and develop management or mitigation strategies for this invasive species.



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The detection rate of a control transmitter was influenced by both environmental conditions and biological noise, which must be properly accounted for in future telemetry studies in similar systems, for instance, by using more powerful transmitters. By determining variable detection rates, this study was able to more accurately interpret lionfish movements, thus providing information that can be useful to develop management or control strategies for this invasive species.

Accepted: Spring 2015

Age, growth and natural mortality of coney (Cephalopholis fulva) from the southeastern United States

PeerJ

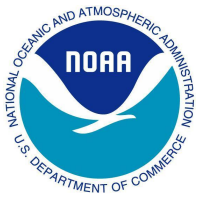
M. L. Burton, J. C. Potts, D. R. Carr (NMFS-SEFSC-Beaufort Laboratory)

- Between 1998–2013 the authors sampled 353 Coney (*Cephalopholis fulva*) from recreational and commercial vessels along the southeastern coast of the United States.
- They determined the age and of each sample and estimated the size and mortality for each age class.
- This paper presents the first new biological data published on the species from southeastern U. S. waters in fifteen years. The study is an improvement on previous studies because of a seven-fold increase in sample size and wider sampling coverage by fishery sector, as previous studies did not include commercially caught fish.

Coney (*Cephalopholis fulva*) sampled from recreational and commercial vessels along the southeastern coast of the United States in 1998–2013 ($n = 353$) were aged by counting opaque bands on sectioned sagittal otoliths. Analysis of otolith edge type (opaque or translucent) revealed that annuli formed in January–June with a peak in April. Coney were aged up to 19 years, and the largest fish measured 430 mm in total length (TL). The weight-length relationship was $\ln(W) = 3.03 \times \ln(TL) - 18.05$ ($n = 487$; coefficient of determination $[r^2] = 0.91$), where W = whole weight in kilograms and TL = total length in millimeters. Mean observed sizes at ages 1, 3, 5, 10, and 19 years were 225, 273, 307, 338, and 400 mm TL, respectively. The von Bertalanffy growth equation for coney was $L_t = 377 (1 - e^{(-0.20(t+3.53)})$. Natural mortality (M) estimated by Hewitt and Hoenig's longevity-based method which integrates all ages was 0.22. Age-specific M values, estimated with the method of Charnov and others, were 0.40, 0.30, 0.26, 0.22, and 0.20 for ages 1, 3, 5, 10, and 19, respectively.

Accepted: February 2015

The Right Whale Mandatory Ship Reporting System: a Retrospective



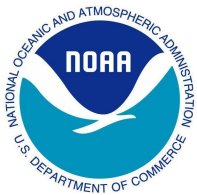
NOAA SCIENTIFIC PUBLICATIONS REPORT MARCH 23, 2015

PeerJ

G. K. Silber (NMFS/OPR), J. D. Adams, M. J. Asaro (NMFS/GARFO), T. V. N. Cole (NMFS/NEFSC), K. S. Moore, L. I. Ward, B. J. Zoodsma (NMFS/SERO)

- The authors synthesize a 15-year time series of ship reports from two Mandatory Ship Reporting (MSR) systems designed to improve mariner awareness about averting ship collisions with the endangered North Atlantic right whale (*Eubalaena glacialis*).
- Annual and monthly changes in the number of incoming reports may reflect significant changes in shipping activities related to such things and increases in container ship size, the 2008-2009 global economic downturn, and growth in U.S. domestic oil/gas production.
- The results suggest that diminished ship traffic from 2008 to the present may have resulted in a more hospitable habitat for right whales.

In 1998, the United States sought and received International Maritime Organization-endorsement of two Mandatory Ship Reporting (MSR) systems designed to improve mariner awareness about averting ship collisions with the endangered North Atlantic right whale (*Eubalaena glacialis*). Under the provisions of the MSR, all ships ≥ 300 gross tons are required to report their location, speed, and destination to a shore-based station when entering two key right whale habitats: one in waters of New England and one off coastal Georgia and Florida. In return, reporting ships receive an automatically-generated message, delivered directly to the ship's bridge, that provides information about right whale vulnerability to vessel collisions and actions mariners can take to avoid collisions. The MSR has been in operation continuously from July 1999 to the present. Archived incoming reports provided a 15-plus year history of ship operations in these two locations. A total of 26,772 incoming MSR messages logged between July 1999 and December 2013 were analyzed for this study. Most ships that were required to report did so, and compliance rates were generally constant throughout the study period. Self-reported vessel speeds when entering the systems indicated that most ships travelled between 10 and 16 (range = 5-20+) knots. Reported ship speeds generally decreased in the time period from 2009 to 2013 following implementation of vessel speed restrictions. The number of reports into the southern system remained relatively constant following a steady increase through 2007, but numbers in the northern system decreased annually beginning in 2008. If reporting is indicative of long-term patterns in shipping operations, it reflects noteworthy changes in marine transportation. Observed declines in ship traffic are likely attributable to the 2008-2009 economic recession, containerized shipping industry making increased use of larger ships that made fewer trips, and diminished oil/gas U.S. imports as previously inaccessible domestic deposits were exploited. Apparent recent declines in shipping activity in the northern system



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likely resulted in lowered collision risks for right whales and reduced their exposure to underwater noise from ships.

Expected publication date: Spring 2015

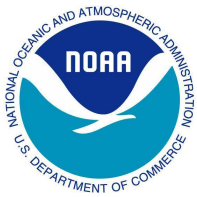
Transport of blue crab larvae in the northern Gulf of Mexico during the Deepwater Horizon oil spill

Marine Ecology Press Series (2.64)

B.T. Jones, J. Gyory, E. K. Grey, M. Bartlein, D. S. Ko, **R. W. Nero**, (NMFS/SEFCS), C. M. Taylor

- Mississippi River Delta acts as a barrier to dispersal for blue crab larvae.
- Potentially oiled larvae (30.2%) are largely confined to the eastern side of the Mississippi River Delta

To better understand population connectivity of the blue crab (*Callinectes sapidus*) and how it may have been affected by the Deepwater Horizon (DWH) oil spill in the northern Gulf of Mexico, researchers simulated blue crab larval dispersal using a drift model. The model encompasses the coastal waters of western Louisiana to the Florida panhandle, with the timeframe of the 2010 spring and summer. Researchers investigated connectivity patterns and intraannual variability in simulated blue crab larvae dispersal, and then applied these findings to the potential impacts of the DWH oil spill. Overall, the Mississippi River delta (MRD) acts as a barrier to larvae dispersal, with a high rate of location retention. Looking at dispersal patterns, of the 7.7% of larvae that successfully settled, 28.5% returned to their predicted parent estuary and 37.5% settled in an adjacent estuary. Although the proportion of successfully settled larvae does not significantly change during spawning, the connectivity among estuaries does significantly decline. Estuaries near the MRD were critical for maintaining connectivity of simulated blue crab larvae populations, since they are the primary source of the few larvae that crossed the MRD. According to the results of the drift model, 30.2% of the simulated larvae were potentially exposed to oil, and these larvae were concentrated on the eastern side of the MRD. For some blue crab spawning events, up to 96.3% of the larvae that successfully settled east of the MRD could have been potentially exposed to oil, which may have substantial implications for the population dynamics in that particular region. These predictions regarding the connectivity of blue crab populations in the northern Gulf of Mexico can be compared with empirical data to better manage this environmentally and economically important species. These findings also suggest that the potentially oiled larvae, largely confined to the eastern side of the MRD, could form a large proportion of the settling larvae and need to be considered in disaster management planning.



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Accepted: February 2015

Reducing bycatch in the United States Gulf of Mexico shrimp trawl fishery with an emphasis on red snapper bycatch reduction

Fisheries Research (1.843)

G. R. Parsons, **D. G. Foster** (NMFS/SEFSC)

- Field trials conducted with different configurations of two shrimp trawl bycatch reduction device designs, the Nested Cylinder and Modified Nested Cylinder, showed decreases in bycatch.
- Trawls with the bycatch reduction devices reduced the over-fished juvenile red snapper bycatch by 50%.

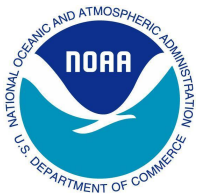
Bycatch, the capture of non-targeted species during commercial fishing, is a global problem that may require novel solutions. The nested cylinder bycatch reduction device (NCBRD), developed using laboratory behavioral studies (Parsons and Foster 2007; Parsons et al. 2012), was evaluated for reducing bycatch in shrimp trawl fisheries and for its application in the U. S. Gulf of Mexico fishery. We examined the efficacy of the NCBRD for retaining shrimp, reducing total bycatch, and reducing bycatch of the over-fished juvenile red snapper (*Lutjanus campechanus*). Using paired trawling on commercial fishing vessels, the shrimp catch, total bycatch, and juvenile red snapper catch were compared from trawls equipped with an NCBRD and control trawls without the device. Trawls with an NCBRD captured about 46 to 100% of shrimp taken in controls, reduced total bycatch by 26 to 60% and reduced red snapper bycatch by about 50%. Comparing catch rates, trawls without the NCBRD caught significantly less (2.6 fewer snapper per hour per trawl). There was significant relationship between red snapper catch and depth, with decreasing red snappers caught with increasing depth. The use of the NCBRD would reduce juvenile red snapper bycatch in the northern Gulf of Mexico by about 50% and suggest that the bycatch reduction device may find application in trawl fisheries worldwide.

Accepted: February 2015

Systematics of North Pacific sand lances of the genus Ammodytes based on molecular and morphological evidence with description of a new species from Japan

Fishery Bulletin (1.783)

J. W. Orr, **S. Wildes**, Y. Kai, **N. Raring**, T. Nakabo, O. Katugin, and **J. Guyon**
(NMFS/AKFSC)



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- The authors have determined that there are four species of sand lances present in the North Pacific, when previously only two species had been described.
- These new taxonomic descriptions will help to clarify the confusion surrounding the nomenclature and biology of these important forage fish.

The systematic status of North Pacific sand lances (genus *Ammodytes*) was assessed from mitochondrial DNA (cytochrome oxidase c subunit 1) sequence data and morphological data to identify the number of species in the North Pacific Ocean and its fringing seas. Although only 2 species, *Ammodytes hexapterus* and *A. personatus*, have been considered valid in the region, haplotype networks and trees constructed with maximum parsimony and genetic distance (neighbor-joining) methods revealed 4 highly divergent monophyletic clades that clearly represent 4 species of *Ammodytes* in the North Pacific region. On the basis of our material and comparisons with sequence data reported in online databases, *A. personatus* is found throughout the eastern North Pacific Ocean, Gulf of Alaska, Aleutian Islands, and the eastern Bering Sea where it co-occurs with a northwestern Arctic species, *A. hexapterus*, that is found throughout the North American Arctic from Hudson Bay, Canada, in the east, through the Beaufort and Chukchi seas, into the northern and western Bering Sea, and to the southern Sea of Okhotsk in the Soya Strait off Hokkaido, Japan. Two other species reside in waters around Japan: *A. japonicus* throughout the Sea of Japan and the Seto Inland Sea and a new species in the Sea of Japan and the North Pacific Ocean off northern Honshu. We designate neotypes for *A. hexapterus* and *A. personatus* because of the absence of type material and the close similarity of these 2 species. *Ammodytes aleutensis* is a junior synonym of *A. japonicus*, and *A. alascanus* is a junior synonym of *A. personatus*.

Expected publication date: June 2015

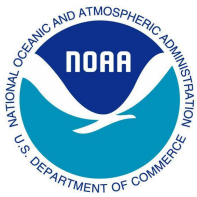
<http://fishbull.noaa.gov/1132/orr.pdf>

Migratory patterns of wild Chinook salmon Oncorhynchus tshawytscha returning to a large, free-flowing river basin

PLoS ONE (3.534)

J. H. Eiler (NMFS/AKFSC), A. N. Evans, and C. B. Schreck

- Chinook salmon populations in western Alaska have exhibited dramatic declines in abundance.
- There is increasing interest in fish movements in response to the potential impacts of climate change on migratory species, particularly in northern latitudes due to the phenomena of arctic amplification.



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- This paper represents one of the few comprehensive, basin-wide movement studies undertaken on this scale and under relatively pristine conditions, and provides a baseline for future comparisons.

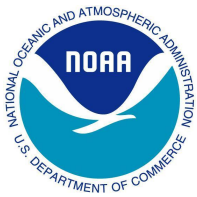
Upriver movements were determined for Chinook salmon *Oncorhynchus tshawytscha* returning to the Yukon River, a large, virtually pristine river basin. These returns have declined dramatically since the late 1990s, and information is needed to better manage the run and facilitate conservation efforts. A total of 2,860 fish were radio tagged during 2002-2004. Most (97.5%) of the fish tracked upriver to spawning areas displayed continual upriver movements and strong fidelity to the terminal tributaries entered. Movement rates were substantially slower for fish spawning in lower river tributaries (28-40 km d⁻¹) compared to upper basin stocks (52-62 km d⁻¹). Three distinct migratory patterns were observed, including a gradual decline, pronounced decline, and substantial increase in movement rate as the fish moved upriver. Stocks destined for the same region exhibited similar migratory patterns. Individual fish within a stock showed substantial variation, but tended to reflect the regional pattern. Differences between consistently faster and slower fish explained 74% of the within-stock variation, whereas relative shifts in sequential movement rates between “hares” (faster fish becoming slower) and “tortoises” (slow but steady fish) explained 22% of the variation. Pulses of fish moving upriver were not cohesive. Fish tagged over a 4-day period took 16 days to pass a site 872 km upriver. Movement rates were substantially faster and the percentage of atypical movements considerably less than reported in more southerly drainages, but may reflect the pristine conditions within the Yukon River, wild origins of the fish, and discrete run timing of the returns. Movement data can provide numerous insights into the status and management of salmon returns, particularly in large river drainages with widely scattered fisheries where management actions in the lower river potentially impact harvests and escapement farther upstream. However, the substantial variation exhibited among individual fish within a stock can complicate these efforts.

Expected publication date: Spring 2015

Using parentage analysis to estimate rates of straying and homing in Chinook salmon
Molecular Ecology (5.84)

M. J. Ford (NMFS/NWFSC), A. R. Murdoch, and M. P. Hughes

- Researchers measure rates of homes and straying of Chinook salmon, providing one of relative few estimates of straying of wild salmon.



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- Results indicate that hatchery fish strayed at higher rates than wild fish and, most interestingly, that the progeny of naturally spawning hatchery fish strayed at higher rates than those of wild fish.

We used parentage analysis based on microsatellite genotypes to measure rates of homing and straying of Chinook salmon (*Oncorhynchus tshawytscha*) among five major spawning tributaries within the Wenatchee River, Washington. Based on analysis of 2248 natural-origin and 11594 hatchery-origin fish, we estimated that the rate of homing to natal tributaries by natural-origin fish ranged from 0% to 99% depending on the tributary. Hatchery-origin fish released in one of the five tributaries homed to that tributary at a far lower rate than the natural-origin fish (71% compared to 96%). For hatchery-released fish, stray rates based on parentage analysis were consistent with rates estimated using physical tag recoveries. Stray rates among major spawning tributaries were generally higher than stray rates of tagged fish to areas outside of the Wenatchee River watershed. Within the Wenatchee watershed, rates of straying by natural-origin fish were significantly affected by spawning tributary and by parental origin: progeny of naturally spawning hatchery-produced fish strayed at significantly higher rates than progeny whose parents were themselves of natural origin. Notably, none of the 170 offspring that were products of mating by two natural-origin fish strayed from their natal tributary. Indirect estimates of gene flow based on F-ST statistics were correlated with but higher than the estimates from the parentage data. Tributary-specific estimates of effective population size were also correlated with the number of spawners in each tributary.

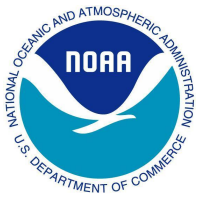
Expected publication date: Spring 2015

A multi-phylum study of grazer-induced paralytic shellfish toxin production in the dinoflagellate Alexandrium fundyense: a new perspective on control of algal toxicity
Harmful Algae (3.34)

C. D. Senft-Batoh, H. G. Dam, S. E. Shumway, and **G. H. Wikfors (NOAA/NEFSC)**

- Grazing by metazoan planktivores induces elevated toxin production by the New England red-tide dinoflagellate *Alexandrium fundyense*.
- Protistan grazers do not induce toxin production in this dinoflagellate.
- The ecology of the consumer community influences the potency of toxicity in red tide blooms.

The present study surveyed grazer-induced stimulation of paralytic shellfish toxin (PST) production by the marine dinoflagellate *Alexandrium fundyense*. The survey included species, known to graze upon *A. fundyense*, from five phyla: the protists, *Polykrikos kofoidii* (Dinoflagellata) and *Tiarina fusus* (Ciliophora), the bivalve molluscs *Mytilus edulis* and *Mya*



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arenaria (Mollusca), the ascidians, *Molgula manhattensis* and *Botrylloides violaceus* (Chordata), and the copepod, *Eurytemora herdmanni* (Arthropoda). Direct (grazers in contact with cells of *A. fundyense*) and indirect (grazers not in contact with cells of *A. fundyense*) induction assays were carried out with protists and copepods. Only indirect assays were carried out with molluscs and ascidians. Indirect assays also tested whether induction of PST production occurred via kairomones or feeding-related cues. All metazoan grazers induced PST production. By contrast, neither of the two species of protistan grazer induced PST production. Direct and indirect induction of PST production was evident for the copepod, with direct induction being significantly higher than indirect induction. Effects upon PST production by phylum, species (nested within phylum), and interactions of phylum by diet, and species by diet, were evident. When induction of PST production occurred, a kairomone effect was apparent, except for *M. edulis*. Similarly, feeding-related cues were evident, except for *E. herdmanni*. An asymptotic relationship between the magnitude of indirect induction of PST production and total cell ingestion by the grazers suggests a saturation response of grazer-induced PST production.

Expected publication date: unknown

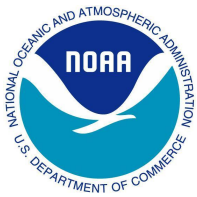
Factors regulating excystment of Alexandrium catenella in Puget Sound, WA, USA

Harmful Algae (3.34)

S. K. Moore (NMFS/NWFSC), B. D. Bill (NMFS/NWFSC), L. R. Hay, J. Emenegger, K. C. Eldred, C. L. Greengrove, J. E. Masura, and D. M. Anderson.

- Researchers studied the factors that regulate the excystment (emergence from the cyst) of the toxic dinoflagellate *Alexandrium catenella* in the Puget Sound.
- Results indicate that there might be a cycle in the timing of excystment.
- Results also indicate that temperature and light are important environmental factors regulating excystment of Puget Sound *Alexandrium*, with the highest rates of excystment observed for the warmest temperature treatment (20°C) and in the light.

Factors regulating excystment of the toxic dinoflagellate *Alexandrium catenella* were investigated in cysts from Puget Sound, Washington State, USA. Experiments were carried out in the laboratory using cysts collected from benthic seedbeds to determine if excystment is controlled by internal or environmental factors. The results suggest that the timing of germination is not tightly controlled by an endogenous clock, though there is a suggestion of a cyclical pattern. This was explored using cysts that had been stored under cold (4°C), anoxic conditions in the dark and then incubated for 6 weeks at constant favorable environmental conditions. Excystment occurred during all months of the year, with variable excystment



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success ranging from 31-90%. When cysts were isolated directly from freshly collected sediments and incubated at the in situ bottom water temperature, a seasonal pattern in excystment was observed that was independent of temperature. This pattern may be consistent with secondary dormancy, an externally modulated pattern that prevents excystment during periods that are not favorable for vegetative growth. However, observation over more annual cycles is required and the duration of the mandatory dormancy period of these cysts must be determined before the seasonality of germination can be fully characterized in *A. catenella* from Puget Sound. Both temperature and light were found to be important environmental factors regulating excystment, with the highest rates of excystment observed for the warmest temperature treatment (20°C) and in the light.

Expected publication date: Spring 2015

Stable isotope analysis elucidates sex and size effects on diet composition of Salish Sea harbor seals (Phoca vitulina)

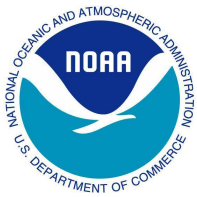
Marine Ecology Progress Series (2.64)

R. Bjorkland (NMFS/NWFSC), S. F. Pearson, S. J. Jeffries, M. M. Lance, A. Acevedo-Gutierrez, and **E. J. Ward (NMFS/NWFSC)**

- Researchers estimate the contribution of prey sources to the diet of harbor seals through stable isotopes.
- The study shows evidence for a size and sex-specific differences in diet between male and female harbor seals.
- In addition, male seals appear to consume more salmon, and other pelagic species, while females appear to consume more species that are potentially near haul out sites.

We apply a Bayesian stable isotope (SI) mixing model to estimate the contribution of prey sources to the diet of harbor seals, *Phoca vitulina* in the San Juan Islands in the Salish Sea. We analyze stable isotopes of C and N collected from 35 seals and 248 prey samples the 18 most common prey items. Our approach involved (1) determining ecologically important prey groups, (2) identifying significant covariates, (3) combining the results of the first two analyses into a Bayesian mixing model, to estimate the relative contribution of different prey items. SI analyses identified sex and size-based differences were significant in foraging habitat selection. Female harbor seals deriving more of their ¹³C signature from nearshore versus offshore food webs, however size effects on foraging habitat selection were somewhat independent of sex, with larger animals of both sexes displaying a greater offshore signal in their diet. In general, small females have a higher contribution of prey items that are ¹³C depleted.

Expected publication date: Summer 2015



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Genetic and morphological divergence in three strains of brook trout commonly stocked in Lake Superior

PLoS ONE (3.534)

G. McKinney, A. Varian, J. Scardina, and K.M. Nichols (NMFS/NWFSC)

- This study compared genetic and morphological divergence in three strains of brook trout *Salvelinus fontinalis* that were historically or currently used for stocking in the Lake Superior Basin.
- Researchers discovered that morphological divergence amongst hatchery brook trout, in some cases, is consistent with divergence due to natural or artificial selection.

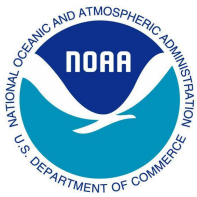
Fitness related traits often show spatial variation across populations of widely distributed species. Comparisons of genetic variation among populations in putatively neutral DNA markers and in phenotypic traits susceptible to selection (QST FST analysis) can be used to determine to what degree differentiation among populations can be attributed to selection or genetic drift. Traditionally, QST FST analyses require a large number of populations to achieve sufficient statistical power; however, new methods have been developed that allow QST FST comparisons to be conducted on as few as two populations if their pedigrees are informative. This study compared genetic and morphological divergence in three strains of brook trout *Salvelinus fontinalis* that were historically or currently used for stocking in the Lake Superior Basin. Herein we examined if morphological divergence among populations showed temporal variation, and if divergence could be attributed to selection or was indistinguishable from genetic

drift. Multivariate QST FST analysis showed evidence for divergent selection between populations. Univariate analyses suggests that the pattern observed in the multivariate analyses was largely driven by divergent selection for length and weight, and moreover by divergence between the Assinica strain and each of the Iron River and Siskiwit strains rather than divergent selection between each population pair. While it could not be determined if divergence was due to natural selection or inadvertent artificial selection in hatcheries, selected differences were consistent with patterns of domestication commonly found in salmonids.

Expected publication date: Spring 2015

Pathogenicity of members of the Vibrionaceae family to cultured juvenile sablefish Aquaculture (2.586)

M. R. Arkoosh and J. P. Dietrich (NMFS/NWFSC)



NOAA SCIENTIFIC PUBLICATIONS REPORT

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- Researchers study the susceptibility of juvenile sablefish to three bacterial pathogens from the family *Vibrionaceae* was examined. *Listonella anguillarum*, *Vibrio ordalii*, and *V. splendidus*.
- Sablefish were susceptible to *L. anguillarum*, but were resistant to *V. ordalii* and *V. splendidus* at exposure concentrations $\leq 1.32 \times 10^7$ colony forming units (CFU)/ml and $\leq 3.57 \times 10^6$ CFU/ml, respectively. The greatest *L. anguillarum* concentration examined (8.7×10^6 cfu/ml) resulted in 24% mortality in juvenile sablefish.
- Sablefish survival to *L. anguillarum* exposure was significantly affected by their mass, with larger fish having a greater probability of survival.

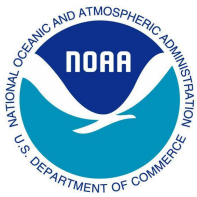
Sablefish are a prized seafood species due to their high oil content and white flaky flesh. Raising these species in culture can help to provide an important source of protein for humans and relief to declining wild fish populations. Understanding the environmental factors that influence the production of sablefish is important for successful culturing. The significance of host-pathogen interactions in sablefish culture and environmental implications are unknown. Pathogens could potentially cause losses of cultured sablefish stocks due to disease, while sablefish cultured in net pens may also serve as reservoirs for pathogens and potentially transmit disease to wild fish species. In this initial study, the susceptibility of juvenile sablefish to three bacterial pathogens from the family *Vibrionaceae* was examined. *Listonella anguillarum*, *Vibrio ordalii*, and *V. splendidus* can pose serious economic threats to cultured fish and shellfish. Groups of juvenile sablefish were exposed to five concentrations of each of the pathogens. Sablefish were susceptible to *L. anguillarum*, but were resistant to *V. ordalii* and *V. splendidus* at exposure concentrations $\leq 1.32 \times 10^7$ colony forming units (CFU)/ml and $\leq 3.57 \times 10^6$ CFU/ml, respectively. The greatest *L. anguillarum* concentration examined (8.7×10^6 cfu/ml) resulted in 24% mortality in juvenile sablefish. A 24% loss of sablefish brood-stock could significantly influence an aquaculture program. As determined by multiple logistic regression, sablefish survival to *L. anguillarum* exposure was significantly affected by their mass, with larger fish having a greater probability of survival. Aquaculture operations could employ various strategies to minimize the loss of juvenile sablefish by accounting for known pathogen susceptibilities and fish size.

Expected publication date: Spring 2015

OAR Publications

Improved seasonal prediction of temperature and precipitation over land in a high-resolution GFDL climate model

Journal of Climate (4.904)



NOAA SCIENTIFIC PUBLICATIONS REPORT

MARCH 23, 2015

L. Jia, X. Yang, G. A. Vecchi, R. G. Gudgel, T. L. Delworth, A. Rosati, W. F. Stern, A. T. Wittenberg, L. Krishnamurthy, S. Zhang, R. Msadek, S. Kapnick, S. Underwood, F. Zeng, W. G. Anderson, V. Balaji, and K. Dixon (OAR/GFDL)

- This study uses a new high-resolution climate model developed at GFDL, called FLOR, to demonstrate skillful seasonal prediction of near-surface air temperature and precipitation over land.
- This study also diagnoses the sources of the skilled predictions. For precipitation, the primary predictable source is the El Niño-Southern Oscillation (ENSO) phenomenon and for near-surface air temperature the two primary predictable sources are external radiative forcing and also ENSO-related patterns.

These predictable components of temperature and precipitation show significant correlation skill for all leads from 0 to 9 months. Importantly, model predictions based on only the few predictable components show considerably better skill than raw model predictions. Skillful seasonal predictions of surface temperature and precipitation over land are in demand, due to their importance to ecosystems and sectors such as agriculture, energy, and transportation. The use of refined statistical analysis and a high-resolution dynamical model leads to significant skill in seasonal predictions of near-surface air temperature and precipitation over land.

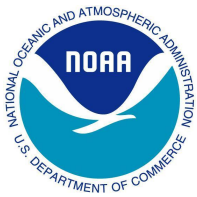
Moreover, a statistical optimization approach identified the most predictable components of seasonal temperature and precipitation over land. The skill in seasonal precipitation over land arises primarily from the El Niño-Southern Oscillation (ENSO) phenomenon. Both a multi-decadal change (in part, from external forcing) component and a spatially heterogeneous ENSO-related component contribute to the seasonal prediction skill of near surface air temperature over land. These predictable components of temperature and precipitation show significant correlation skill for all leads from 0 to 9 months. Importantly, reconstructed predictions based only on the few leading predictable components from the model show considerably better skill relative to observations than raw model predictions. Output from predictions with FLOR are being made available to NOAA's National Weather Service (and the world) through the North American Multi-Model Ensemble for Seasonal Prediction.

Expected publication date: March 2015

Potential impact of climate change on the intra-Americas sea: Part-1. A dynamic downscaling of the CMIP5 model projections

Journal of Marine Systems (1.425)

Y. Liu (OAR/AOML), D. B. Enfield (OAR/AOML), B. A. Muhling (NMFS/SEFSC), J. T. Lamkin (NMFS/SEFSC), F. E. Muller-Karger, and M. A. Roffer



NOAA SCIENTIFIC PUBLICATIONS REPORT

MARCH 23, 2015

- This study conducted a computer simulation of the tropical and subtropical Atlantic Ocean including the Gulf of Mexico at a much higher spatial resolution than those used by the Intergovernmental Panel on Climate Change (IPCC), using the various possible scenarios of future greenhouse gas concentrations in the Earth's atmosphere tested by the IPCC.
- This warming trend may increase the chance for hurricane intensification during landfall in the northern and eastern Gulf, and may also expose the animals and other organisms living in the Gulf of Mexico to increasing frequency of thermal stress.

This “downscaled” model predicts a significant reduction of the flow of water in the Gulf of Mexico during this century. Consistent with this, the forecast suggests that the Louisiana-Texas Shelf and the West Florida Shelf may experience lower rates of the phenomenon called “upwelling” by which deep cool water moves onto the shelf and toward the coast. This means that we may see intense summertime warming in the Louisiana-Texas Shelf and the West Florida Shelf. The warming trend can have several implications for the region. For one, this may increase the chance for hurricane intensification during landfall in the northern and eastern Gulf. The warming may also expose the animals and other organisms living in the Gulf of Mexico, such as fish, marine mammals, and turtles as well as coral reefs and sponges, to increasing thermal stress.

Published: February 2015

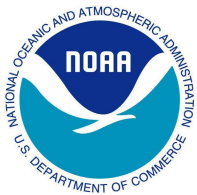
High resolution observations of the near-surface wind field over an isolated mountain and in a steep river canyon

Atmospheric Chemistry and Physics (5.298)

B.W. Butler, N.S. Wagenbrenner, J.M. Forthofer, B.K. Lamb, K.S. Shannon, **D. Finn, R. M. Eckman, K. Clawson**, L. Bradshaw, P. Sopko, **S. Beard**, D. Jimenez, C. Wold, and M. Vosburgh (OAR/ARL)

- This study presents high-resolution surface wind datasets collected from an isolated mountain and a steep river canyon.
- These findings suggest that traditional operational weather model (i.e., with numerical grid resolutions of around 4 km or larger) wind predictions are not likely to be good predictors of local near-surface winds at sub-grid scales in complex terrain.
- The ability to predict wind flow in complex terrain is important in understanding wildland fire behavior, the transport and dispersion of pollutants, simulation of convection driven processes, wind turbine siting, and processes affecting climate change.

A number of numerical wind flow models have been developed for simulating wind flow at



NOAA SCIENTIFIC PUBLICATIONS REPORT

MARCH 23, 2015

relatively fine spatial resolutions (e.g., ~100 m); however, there are very limited observational data available for evaluating these high resolution models. This study presents high-resolution surface wind datasets collected from an isolated mountain and a steep river canyon. The wind data are presented in terms of four flow regimes: upslope, afternoon, downslope, and a synoptically-driven regime. There were notable differences in the data collected from the two terrain types. For example, wind speeds on the isolated mountain increased with distance upslope during upslope flow, but generally decreased with distance upslope at the river canyon site during upslope flow. In a downslope flow, wind speed did not have a consistent trend with position on the isolated mountain, but generally increased with distance upslope at the river canyon site. The highest measured speeds occurred during the passage of frontal systems on the isolated mountain. Mountaintop winds were often twice as high as wind speeds measured on the surrounding plain. The highest speeds measured in the river canyon occurred during late morning hours and were from easterly down canyon flows, presumably associated with surface pressure gradients induced by formation of a regional thermal trough to the west and high pressure to the east. Under periods of weak synoptic forcing, surface winds tended to be decoupled from large-scale flows, and under periods of strong synoptic forcing, variability in surface winds was sufficiently large due to terrain-induced mechanical effects (speed-up over ridges and decreased speeds on leeward sides of terrain obstacles) that a large-scale mean flow would not be representative of surface winds at most locations on or within the terrain feature. These findings suggest that traditional operational weather model (i.e., with numerical grid resolutions of around 4 km or larger) wind predictions are not likely to be good predictors of local near-surface winds at sub-grid scales in complex terrain. Measurement data can be found at: <http://www.firemodels.org/index.php/windninja-introduction/windninja-publications>

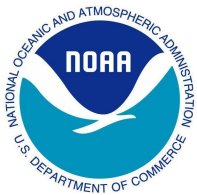
Expected publication date: April 2015

Methane leaks from three large U.S. natural gas fields in line with federal estimates

Journal of Geophysical Research-Atmospheres (3.44)

J. Peischl, T. B. Ryerson, K. C. Aikin, J. A. de Gouw, J. B. Gilman, J. S. Holloway, B. M. Lerner, R. Nadkarni, J. A. Neuman, J. B. Nowak, M. Trainer (NOAA), C. Warneke, and D. D. Parrish (OAR/ESRL)

- The authors studied leaks of methane, an important short-lived greenhouse gas, from large natural gas fields in the eastern U.S.
- The leak rates for three large natural gas fields in the eastern U.S. were about 1 percent of the production rate for those fields.



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- This observed rate is consistent with estimates based on other approaches and lower than the leak rates that have been measured in western gas fields.

Methane is an important short-lived greenhouse gas, and its emission has implications for both climate and air quality. In this study, the authors found that the methane leak rates from three large natural gas fields in the eastern U.S. are about 1% of the production rate of those fields. The findings were measured using an independent method based atmospheric data gathered in an airborne study using the NOAA WP-3D research aircraft in summer of 2013. The leak rates are in line with federal estimates that are based on other approaches. The three fields studied represent about 20% of US natural gas production. The leak rates for the three eastern gas fields are lower than those measured in western gas fields (California, Utah, Colorado) that are a much smaller percentage (3%) of the US natural gas production. The variable methane leak rates in the different gas fields suggests that other chemicals emitted during gas production, including compounds that contribute to episodes of poor air quality, are also variable. There could be many reasons for significant regional differences in leak rates, including variations in the methane composition of gas and regional differences in equipment, techniques, and regulations.

Expected publication date: February 2015

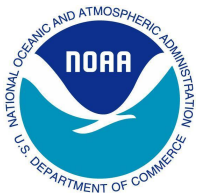
Meteorological modeling using WRF-ARW model for Grand Bay Intensive studies of atmospheric mercury

Atmosphere (1.015)

F. Ngan, M. Cohen, W. Luke, X. Ren, and R. Draxler (OAR)

- Mercury pollution continues to be a concern because of its effects on ecosystems, including threats to public health through fish consumption. Atmospheric mercury emissions and subsequent deposition is a significant pathway for mercury entering ecosystems. Therefore, it is important to understand mercury sources, transport and fate. Observations reveal that mercury in precipitation in the Gulf of Mexico region is higher than in any other region in the U.S.
- Researchers carried out fine resolution meteorological simulations to study atmospheric mercury at the Grand Bay NERRS and to develop fine resolution meteorological fields.
- The simulations by the Weather Research and Forecasting (WRF) model with 3-dimensional (3-D) grid and observational nudging were in good agreement with the mercury measurements collected at the station.

Measurements at the Grand Bay National Estuarine Research Reserve support a range of research activities aimed at improving the understanding of the atmospheric fate and transport



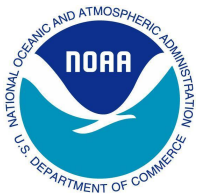
NOAA SCIENTIFIC PUBLICATIONS REPORT

MARCH 23, 2015

of mercury. Routine monitoring was enhanced by two intensive measurement periods conducted at the site in summer 2010 and spring 2011. Detailed meteorological data are required to properly represent the weather conditions, determine the transport and dispersion of plumes, and understand the wet and dry deposition of mercury. To describe the mesoscale features that might influence future plume calculations for mercury episodes during the Grand Bay Intensive campaigns, fine resolution meteorological simulations using the Weather Research and Forecasting (WRF) model were conducted with various initialization and nudging configurations. The WRF simulations with nudging generated reasonable results in comparison with conventional observations in the region and measurements obtained at the Grand Bay site, including surface and sounding data. The grid nudging, together with observational nudging, had a positive effect on wind prediction. However, the nudging of mass fields (temperature and moisture) led to overestimates of precipitation which may introduce significant inaccuracies if the data were to be used for subsequent atmospheric mercury modeling. The regional flow prediction was also influenced by the reanalysis data used to initialize the WRF simulations. Even with observational nudging, the summer case simulation results in the fine resolution domain inherited features of the reanalysis data, resulting in different regional wind patterns. By contrast, the spring intensive period showed less influence from the reanalysis data. The simulations by the Weather Research and Forecasting (WRF) model with 3-dimensional (3-D) grid and observational nudging were in good agreement with the mercury measurements collected at the Grand Bay National Estuarine Research Reserve station. The 3-D grid nudging at a fine spatial scale reduced errors in the wind predictions at the surface and aloft but did not degrade model performance. However, the nudging of temperature and moisture observations resulted in more extraneous precipitation that may have potentially large impacts on mercury fate and transport modeling through the effects of wet deposition. Larger differences were observed in the results based on different reanalysis data used to initialize the WRF simulations in the summer intensive period than in the spring period. Backward trajectories using meteorological data initialized by NCEP's North American Regional Reanalysis on a mercury episodic day during summer 2010 indicated air masses coming from the "clean" Gulf (i.e. with no large sources of mercury). However, using WRF simulations initialized by other reanalysis data, the backward trajectories showed the air coming from the west, potentially bringing pollutants from emissions sources to the Grand Bay location.

Expected publication date: April 2015

*Recent trends in global emissions of hydrochlorofluorocarbons and hydrofluorocarbons:
Reflecting on the 2007 adjustments to the Montreal Protocol*



NOAA SCIENTIFIC PUBLICATIONS REPORT

MARCH 23, 2015

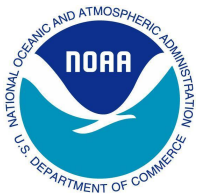
Journal of Physical Chemistry

S. Montzka, M. McFarland, S.O. Andersen, **B. Miller**, **D. Fahey**, **B. Hall**, **L. Hu**, **C. Siso**, and **J.W. Elkins (OAR/ESRL)**

- Global-scale atmospheric measurements are used to investigate the effectiveness of recent adjustments to production and consumption controls on hydrochlorofluorocarbons (HCFCs) under the Montreal Protocol on Substances that Deplete the Ozone Layer (Montreal Protocol) and to assess recent projections of large increases in hydrofluorocarbon (HFC) production and emission.
- The results show that aggregate global HCFC emissions did not increase appreciably during 2007–2012 and suggest that the 2007 Adjustments to the Montreal Protocol played a role in limiting HCFC emissions well in advance of the 2013 cap on global production.

An international agreement in 2007 to deal with the last remaining ozone-depleting chemicals used in large quantities is working, according to a new analysis. Atmospheric emissions of those chemicals, called hydrochlorofluorocarbons (HCFCs) and used in refrigeration and air conditioning, are no longer increasing, after having increased consistently over the past few decades, according to this study. But the new paper also reports that other substitute chemicals, which are also greenhouse gases, are on the rise, and international decision makers are considering new regulations to cap and reduce those emissions. The paper describes progress in phasing out the last group of ozone-depleters used in significant quantities: HCFCs, which are first-generation replacements for other, more ozone-damaging chemicals initially targeted by the Montreal Protocol. In 2007, the Montreal Protocol parties agreed to an accelerated schedule for the global phase-out of HCFCs. Although HCFC-use in developing countries could have continued until 2040, the prospect that an accelerated phase-out would reduce future ozone depletion and slow climate change in the coming decades prompted the new limits. This study presents evidence that the recent accelerated phase-out has helped slow global emissions of HCFCs, but it also documented a 45-percent increase in emissions of chemicals used as HCFC substitutes. While these second-generation substitutes, called hydrofluorocarbons, don't deplete ozone as HCFCs do, many are potent greenhouse gases and contribute to warming, in amounts that are currently small but could become significant in the future. The study also examined sources of hydrofluorocarbon emissions, finding that global emissions of these chemicals can be attributed in roughly equal amounts to mobile air conditioning, commercial refrigeration, and all other uses (including solvents and industrial refrigeration) combined.

Expected publication date: Unknown



NOAA SCIENTIFIC PUBLICATIONS REPORT

MARCH 23, 2015

NWS Publications

The value of dual-polarization radar in diagnosing the complex microphysical evolution of an intense snowband

Bulletin of the American Meteorological Society (11.57)

J. C. Picca, D. M. Schultz, **D. Novak**, B. Colle, S. Ganetis, and M. Sienkiewicz (NOAA/NWS)

- This study provides further demonstration of the benefit of dual-polarization radar data over conventional radar data.
- Dual-polarization radar data, which allows for a more in depth assessment of hydrometeors present within a precipitation band, allowed for a better understanding and forecast for a rare very heavy cold-season precipitation band.
- Improved forecasts of high-impact cold season precipitation bands are likely with dual-polarization radar data.

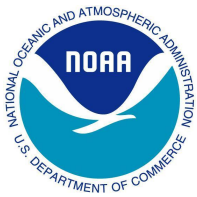
The northeast U.S. extratropical cyclone of 8–9 February 2013 produced blizzard conditions and more than 0.6–0.9 m (2–3 ft) of snow from Long Island through eastern New England. A surprising aspect of this blizzard was the development and rapid weakening of a snowband to the northwest of the cyclone center with radar reflectivity factor exceeding 55 dBZ. Because the radar reflectivity within snowbands in winter storms rarely exceeds 40 dBZ, this event warranted further investigation. The high radar reflectivity was due to mixed-phase microphysics in the snowband, characterized by high differential reflectivity ($ZDR > 2$ dB) and low correlation coefficient ($CC < 0.9$), as measured by the operational dual-polarization radar in Upton, New York (KOKX). Consistent with these radar observations, heavy snow and ice pellets (both sleet and graupel) were observed. Later, as the reflectivity decreased to less than 40 dBZ, surface observations indicated a transition to primarily high-intensity dry snow, consistent with lower-tropospheric cold advection. Therefore, the rapid decrease of the 50+ dBZ reflectivity resulted from the transition from higher-density, mixed-phase precipitation to lower-density, dry-snow crystals and aggregates. This case study indicates the value that dual-polarization radar can have in an operational forecast environment for determining the variability of frozen precipitation (e.g., ice pellets, dry snow aggregates) on relatively small spatial scales.

Published: December 2014

<http://journals.ametsoc.org/doi/pdf/10.1175/BAMS-D-13-00258.1>

A preliminary assessment of using spatiotemporal lightning patterns for a binary classification of thunderstorm mode

American Meteorological Society Weather and Forecasting Journal (1.61)



NOAA SCIENTIFIC PUBLICATIONS REPORT

MARCH 23, 2015

P. Miller, A. Ellis and **S. Keighton (NWS Blacksburg)**

- The authors conduct a preliminary regional assessment of the viability of using spatiotemporal lightning patterns to classify storms.
- The study suggests that lightning can add to the other more traditional observational datasets, such as radar, in distinguishing characteristics of thunderstorms so that forecasts and warnings can improve.

This study provides a preliminary, regional assessment of the viability of using spatiotemporal lightning patterns to classify storms into single- versus multi- and supercell storm modes. Total lightning flashes (intracloud and cloud-to-ground flashes) occurring during the afternoon and evening of the period May–August 2012 within an area of the central Appalachian Mountains region were grouped based on their spatial and temporal characteristics using single-linkage clustering. The resulting discrete thunderstorm clusters were characterized in terms of duration, motion, areal extent, and shape. These values were used to formulate four individual attribute scores representing the similarity to the expected values for a typical single-cell thunderstorm. The four scores were then combined into a storm index (SI) using relative weights determined through the analytic hierarchy process (AHP) performed on input from operational forecasters. Of the study days, 89 (72.4%) possessed appreciable lightning, of which 36 (40%) possessed a defined minimum amount of lightning activity required for further analysis. These 36 storm days were divided into two tiers according to the distribution of median daily SI values. The tier containing the 24 storm days (66.7%) with the largest median SI values possessed statistically significant smaller values of 0–6-km wind shear [13.8 knots (kt; $1 \text{ kt} = 0.51 \text{ m s}^{-1}$)] versus the 12 days in the lower tier of SI values (26.5 kt). This consistency between the total lightning-based classification scheme and increased vertical wind shear associated with lightning-defined multi- and supercells, also evident in synoptic atmospheric composites, lends credibility to the procedure.

Published: 12 February 2015

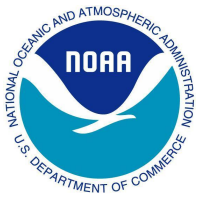
<http://journals.ametsoc.org/doi/full/10.1175/WAF-D-14-00024.1>

NESDIS Publications

Extended reconstructed sea surface temperature version 4 (ERSST.v4), Part II. Parametric and structural uncertainty estimation

Journal of Climate (4.90)

W. Liu, B. Huang, P. W. Thorne, V. F. Banzon, H-M. Zhang, E. Freeman, J. Lawrimore, T. C. Peterson, T. M. Smith, and S. D. Woodruff (NESDIS/NCDC)



NOAA SCIENTIFIC PUBLICATIONS REPORT

MARCH 23, 2015

- The Extended Reconstructed Sea Surface Temperature (ERSST) has been updated to a new version and SST uncertainty in the ERSST is quantified.
- The ensemble analyses show a wider uncertainty range before 1900, as well as an uncertainty maximum around World War II.
- In comparison with HadSST3, ERSST.v4 has larger parametric uncertainties at smaller spatial and shorter time scales and smaller parametric uncertainties at longer time scales.

This paper describes the parametric and structural uncertainty quantification for the monthly Extended Reconstructed Sea Surface Temperature (ERSST) version 4 (v4). A Monte Carlo ensemble approach was adopted to characterize parametric uncertainty, because initial experiments indicate the existence of significant nonlinear interactions. Globally, the resulting ensemble exhibits a wider uncertainty range before 1900, as well as an uncertainty maximum around World War II. Changes at smaller spatial scales in many regions, or for important features such as Niño-3.4 variability, are found to be dominated by particular parameter choices. Substantial differences in parametric uncertainty estimates are found between ERSST.v4 and the independently derived Hadley Centre SST version 3 (HadSST3) product. The largest uncertainties are over the mid and high latitudes in ERSST.v4 but in the tropics in HadSST3. Overall, in comparison with HadSST3, ERSST.v4 has larger parametric uncertainties at smaller spatial and shorter time scales and smaller parametric uncertainties at longer time scales, which likely reflects the different sources of uncertainty quantified in the respective parametric analyses. ERSST.v4 exhibits a stronger globally averaged warming trend than HadSST3 during the period of 1910–2012, but with a smaller parametric uncertainty. These global-mean trend estimates and their uncertainties marginally overlap. Several additional SST datasets are used to infer the structural uncertainty inherent in SST estimates. For the global mean, the structural uncertainty, estimated as the spread between available SST products, is more often than not larger than the parametric uncertainty in ERSST.v4. Neither parametric nor structural uncertainties call into question that on the global-mean level and centennial time scale, SSTs have warmed notably.

Published: January 2015

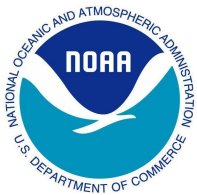
<http://journals.ametsoc.org/doi/full/10.1175/JCLI-D-14-00007.1>

NOS Publications:

Exploration and mapping of the deep Mesoamerican reef

Oceanography

P. J. Etnoyer, M. L. Brennan, D. Finamore, **S. Hammond**, M. Vargas, X. Janson, S. Tuzun, J. Wagner, D. Ferraro, and W. Snyder (NOS/NCCOS)



NOAA SCIENTIFIC PUBLICATIONS REPORT

MARCH 23, 2015

- The cruise represents the first ever high-resolution mapping of the continental slope off Belize, and the first observations of several species of deep-sea corals in this country.
- One of the coral samples collected by the expedition is expected to yield hundreds of years of climate data from the deep Mesoamerican Reef.

In August 2014, the Exploration Vessel (E/V) Nautilus conducted multibeam mapping and remotely operated vehicle (ROV) dives that explored the Mesoamerican Reef's offshore slopes, atolls, and outer cayes. The overall objectives of the expedition included mapping of areas extending from 50 meters to 3,000 meters, exploring for ecosystem habitats, groundtruthing of multibeam and backscatter data using the Hercules ROV, and collecting deep-sea corals and sponges for the purposes of species identification, age and growth determinations. In six days of operations, Nautilus mapped nearly 15 percent of the Belize fore-reef and slope deeper than 50 m. Multibeam coverage extended to a depth of 3,000 m and revealed a steep fore-reef (with slopes between 15°–25°) and sediment channels ranging from 100s–1000s meters in width and 10s–100s meters deep. Rocky habitats (near 500 m) were colonized by octocorals *Chrysogorgia fewkesii* and *Iridogorgia* and the large primnoid sea fan *Paracalyptrophora carinata*. The stony corals included *Enallopsammia rostrata* and *Madrepora oculata*. Overall, diversity was high, but the abundance of coral colonies was sparse, likely due to high sedimentation rates and a paucity of exposed hard bottom habitat.

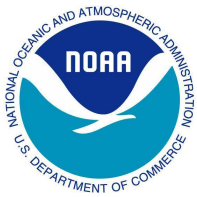
Expected publication date: March 2015

OTHER REPORTS, BOOK CHAPTERS, AND INTERNAL PUBLICATIONS

REServ: An ecosystem services assessment using bioextraction technologies for removal of nitrogen and other substances in Long Island Sound and the Great Bay/Piscataqua Region
NOAA Coastal Ocean Program Decision Analysis Series No. XXX.

S. Bricker (NOS), J. Ferreira, C. Zhu, J. Rose (NMFS), E. Galimany (NMFS), G. Wikfors (NMFS), C. Saurel, R. L. Miller, J. Wands, P. Trowbridge, R. Grizzle, K. Wellman, R. Rheault, J. Steinberg (NOS), A. Jacob (NOS), E. Davenport (NOS), M. Tedesco, S. Ayvazian

- Bioextractive removal of nitrogen through shellfish aquaculture does not contribute significantly (only ~2-3%) to the removal of nitrogen compared to total inputs in both systems.
- Based on a costs avoided method of estimation, the value of the nitrogen currently removed through oyster cultivation and harvest in Long Island Sound (LIS) range from \$8.5 to \$230.3 and in \$1.1 and \$1.3 million in Great Bay/Piscataqua (GBP). If aquaculture production were to expand, the potential value could range between \$17.4



NOAA SCIENTIFIC PUBLICATIONS REPORT

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and \$469.3 million in LIS, and 4.3 - \$5.0 million in GBP, depending on the alternative abatement approach considered.

- The use of shellfish biotechnology as a water quality management tool will require further verifications of actual production and revenues of shellfish harvesters and modifications of existing public cost-share programs or inclusion in economic nutrient trading programs.

Nutrient-related water quality degradation, called eutrophication, is an issue of concern in Long Island Sound (LIS) and Great Bay Piscataqua Estuaries (GBP). The REServ project evaluated the feasibility and potential of nutrient removal directly from the water via mollusk filtration (bioextraction) as a complement to traditional land-based management measures. Results suggest that expansion of oyster aquaculture would lead to removal of 2 to 3% of the total nitrogen load in both systems.

Published: February 2015

Transport pathways of marine larvae around the Mariana Archipelago

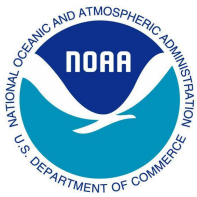
NOS Technical memo

M. S. Kendall, M. Poti, T. Wynne, C. Barker, C. O'Connor, and P. Houk (NOS/Center for Coastal Monitoring and Assessment)

- The overall goal of the assessment was to evaluate ocean currents as a mechanism of transport and to compare connectivity among larvae with different life-history characteristics using computer simulations.
- Based on evidence from drifters and models it appears that the Marianas are rather isolated from their island neighbors as either a destination or source of larvae.
- Self-seeding may be of great importance to sustaining Mariana reef populations and position within the archipelago affects connectivity among islands.

Many coral reef organisms have a larval development phase in pelagic environments. These larvae may be returned to their natal islands or dispersed downstream in ocean currents.

Understanding the strength and geographic patterns of this larval connectivity is an important part of managing marine ecosystems through ecosystem based-fisheries management plans, marine protected area (MPA) network design, recovery strategies for endangered species, and promoting reefs that are resilient to disturbance. Sufficient sources of larvae must be maintained to sustain future generations. In recent years there have been calls from scientists and managers in the Mariana Archipelago for a better understanding of larval connectivity. The Marianas experience a range of ocean currents from the westward flowing North Equatorial Current (NEC) through the southern islands, to the eddies spun off the NEC through the northern



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islands. Island roles as larval sources and destinations as well as self-seeding versus larval import were evaluated for each of the Marianas. Cumulative connectivity over a recent 9 year span was investigated for the entire region. For Guam and Saipan, the two most populous islands, the seasonal and inter-annual variation in larval supply was examined.

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Great Lakes water levels surge

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D. Gronewold (OAR/GLERL), A. Clites (NOAA/GLERL), J. Bruxer, K. Kompoltowicz, J. Smith, T. Hunter (NOAA/GLERL), and C. Wong (NOS/CO-OPS)

- Unusual hydrologic events on two of the largest lakes (by surface area) on Earth underscore a need for improved understanding of the connections between climate, the regional water budget and Great Lakes water levels.
- The authors expect to author a follow-up article that explains what caused this surge in water levels.

At no other point in recorded history have water levels risen as much on Lake Superior and Michigan-Huron as they did from January 2013 through December 2014. Since September 2014, all of the Great Lakes have been above their seasonal averages for the first time since the late 1990s. The recent surge in water levels brings to an end a 15-year period of persistent below-average water levels on Lakes Superior and Michigan-Huron. The rebound in water levels broke records across the region. The net rise in water levels on Lake Superior from January 2013 through December 2014 was roughly 2 feet (about 0.6 meters), the highest net increase ever recorded for a two year period starting in January and ending in December. Similarly, on Lake Michigan-Huron, the net rise in water levels from the record-low in January 2013 through December 2014 was 3.1 feet (about 1 meter), an increase that nearly tied the previous record set in 1950-1951.

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